

MISTE/LTMPEF International Space Station Mission

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NASA is developing a flight experiment called MISTE (Microgravity Scaling Theory Experiment) for a future International Space Station (ISS) mission. MISTE is planned to fly in the Low Temperature Microgravity Physics Experiments Facility (LTMPEF) located on the ISS Japanese Experimental Module – Exposed Facility (JEM-EF). The goal of this experiment is to provide a stringent test of scaling theory predictions for critical behavior near a liquid-gas critical point. This experiment is designed to perform PVT , heat capacity at constant volume, C_V , and isothermal susceptibility, χ_T , measurements near the ^3He liquid-gas critical point ($T_c = 3.3\text{K}$). This microgravity study will require a long duration flight because of the long thermal equilibration times near the critical point. The LTMPEF low temperature dewar is being designed for five missions with each mission accommodating two scientific experiments for a 4.5 month flight. A description of the MISTE experimental approach for performing critical point measurements will be discussed. Thermal issues related to the attainment of nanokelvin temperature resolution and to the flight dewar lifetime will also be presented. [This work was supported by NASA.]